Supplementary Information (SI) for Chemical Science.
This journal is © The Royal Society of Chemistry 2025

Supporting Information
for
Integrating Social Responsibility and Diversity, Equity, and Inclusion into the Graduate Chemistry Curriculum

Course Information, Syllabus, and Teaching Guide

Kay T. Xia,[1,2]* F. Dean Toste,[1,2] Matthew B. Francis,[1,3] Anne M. Baranger[1,4]*

[1]Department of Chemistry, University of California, Berkeley, California 94720-1460, United States

[2]Chemical Sciences Division, Lawrence Berkeley National Laboratory, University of California, Berkeley, CA 94720-1460, United States

[3]Materials Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, California 94720-8099, United States

[4]Graduate Group in Science and Mathematics Education, University of California, Berkeley, California 94720-1460, United States

Note: the authors encourage the use and adaptation of the included materials for teaching similar courses at other institutions or in other disciplines. With the use of these materials, please acknowledge this publication and its authors, and the Scientific Responsibility and Citizenship course taught in the UC Berkeley Department of Chemistry. The corresponding authors (K.T.X. and A.M.B.) can be contacted for further questions.

Table of Contents:

Course Information and Syllabus 3

Teaching Guide 8
Lesson 1 Plan 9
Lesson 2 Plan 11
Lesson 3 Plan 13
Lesson 4 Plan 15
Lesson 5 Plan 16
Lesson 6 Plan 17
Guide for Designing Case Studies 19
Suggested Reading Guide 21

Course Information and Syllabus

CHEMISTRY 299
SCIENTIFIC RESPONSIBILITY AND CITIZENSHIP
Fall 2022

Instructors:
Professor Matthew B. Francis (mfrancis@berkeley.edu)
Professor Anne M. Baranger (abaranger@berkeley.edu)
Kay T. Xia (ktx@berkeley.edu)

Meeting Times and Location:
Section 1: Monday 5-6pm, Physics 2
Section 2: Wednesday 5-6pm, Physics 2

Office Hours
Matt can be reached at Friday Matt Chats on Fridays 1-2pm, Latimer 419
Anne can be reached at Associate Dean Office Hours on Mondays 3-4pm, Lewis 213
Kay will hold drop-in hours on Wednesdays 11-12pm, Latimer 629
Additional office hours can be arranged by appointment with any of the course instructors. Send an email to find a time.

Course Objectives
Most STEM curricula focus solely on scientific content and knowledge. Yet, the impacts of science have profound effects on society, and the inequities in our social structures influence the practice of research. The results of scientific research have historically benefited some populations, and disproportionately harmed others. These existing biases are perpetuated when we fail to acknowledge and correct them. Through this course, we hope to teach students the importance and relevance of social theories (theoretical frameworks) to our work as professional scientists.

Course Materials
All course materials will be provided by the instructional team.

Course Participation and Grading
This course is required for all first year graduate students in chemistry as part of their CHEM299 research credit. Grading will be based on participation, and will be effectively pass/fail. You must attend all six sessions of this course in order to pass. Everyone who passes will receive a letter grade of A (your research credit is letter-graded by default). There will be some short assigned reading prior to each class. These readings are not expected to take more than 20-30 minutes to complete.

Absence Policy
If you are unable to attend a given session of the course, please contact Matt, Anne, and Kay promptly. A makeup assignment will be given, which will include assigned readings on the topic of the class you are missing, and a 2-page written reflection. If you are under extenuating circumstances, accommodations will be made on a case by case basis.

Diversity Statement

In an ideal world, science would be objective. However, much of science is subjective and is historically built on a small subset of privileged voices. Integrating a diverse set of experiences is important for a more comprehensive understanding of science. We are committed to creating a learning environment welcoming of all students that supports a diversity of thoughts, perspectives and experiences, and respects different identities and backgrounds (including race/ethnicity, nationality, gender identity, socioeconomic class, sexual orientation, language, religion, ability, etc.), and that the diversity that students bring to this class be viewed as a resource, strength and benefit.

As a participant in this class, please join us in being proactive about making every student feel included and respected. We are in the process of learning together, and we, the instructors included, are committed to improving and keeping an open mind to constructive criticism. Your suggestions are encouraged and appreciated. Please let us know ways to improve the effectiveness of the course for you personally or for other students or student groups. If any of our class meetings conflict with your religious events, please let us know so that we can make arrangements for you.

To help accomplish this: (i) if you have a name and/or set of pronouns that differ from those that appear in your official records, please let us know, (ii) if something is said in class (by anyone) that makes you feel uncomfortable, please talk to us about it (anonymous feedback is always an option: [link]).

Please reach out to discuss with us at any time.

This Diversity Statement was adapted from examples from Brown University's Sheridan Center for Teaching and Learning: https://www.brown.edu/sheridan/teaching-learning-resources/inclusive-teaching/statements and Stanford University's CS 257 course syllabus: https://web.stanford.edu/class/cs257/

Classroom Agreements

In this course, we will cover topics that may be uncomfortable at times. We want to respect everyone's boundaries, but also challenge you to lean into your discomfort and create a "brave space" for learning:

1. Take space/make space: Know yourself, balance your listening and talking.
2. Speak honestly and personally. Remember what is true for you depends on you. Use "I" statements. Listen actively, respectfully, and with an open mind.
3. Use evidence (data, personal experience, readings, etc) to support your claims. De-escalate; criticize ideas, not individuals.
4. Assume best intentions, BUT your intentions may not be the same as your impact. Own your impact.
5. We must make sure everyone feels safe. But safe is not the same as comfortable. We are wired to flee discomfort, but discomfort is powerful. Take risks, make mistakes. Avoid judgment, blame, and inflammatory language.
6. You don't have to play, but you are not allowed to damage the game. Active listening is also participation.
7. Anonymity. What is said (and by who) stays, what is learned can leave.
8. We are all in this together. Take care of yourself and each other!

You are not responsible for having all the answers, but you are responsible for seeking and learning. Ally is an action word.

Syllabus

Class 1
Dates: September 12 and 14
Topic: Introduction to scientific responsibility and DEI
As scientists, do we have a responsibility to improve DEI? Why or why not? In what ways?

Class 2
Dates: September 26 and 28
Topic: Case study—Berkeley the atomic bomb
From the development of the atomic bomb to CRISPR, Berkeley scientists have been involved in the research behind paradigm-shifting technologies. To what extent are scientists responsible for the impacts and applications of basic research?

Class 3
Dates: October 17 and 19
Topic: Case study—hormonal birth control
What structural inequities exist in drug development? Whose knowledge is valued? Whose diseases and treatments are prioritized?

Class 4
Dates: October 24 and 26
Topic: Case study—rare earth elements
To what extent are we responsible for considering the sourcing of our chemicals and the disposal of chemical waste?

Class 5
Dates: November 7 and 9
Topic: Case study—legacy chemicals
When the risks of a chemical are discovered after it is already in widespread use, how can we respond to mitigate harm?

Class 6
Dates: November 28 and 30
Topic: Our own community and scientific citizenship
How should we treat each other to be respectful and supportive of the diversity of ideas, identities, and experiences that are part of our community?

Additional Information

Accommodations for Students with Disabilities

Academic accommodations ensure that all students have a fair chance at academic success. Please make the instructional team aware of any letters of accommodation from the Disabled Students Program (DSP) as soon as possible so that we can figure out the necessary arrangements. If an accommodation is needed and has not been discussed with a Disability Specialist at DSP, please do so as soon as possible (https://dsp.berkeley.edu/).
For more information, please see the Academic Accommodations Hub (https://evcp.berkeley.edu/programs-resources/academic-accommodations-hub)

Mental Health Resources

This semester is taking place under historically unprecedented health and societal conditions. Diminished mental health can interfere with academic performance, and more importantly, quality of life. It is more important than ever to be cognizant of one's mental health. Mental health resources are available to all students from the University through Counseling and Psychological Services (CAPS). Getting help when necessary is both smart and courageous. Self-care is essential.
(https://uhs.berkeley.edu/caps)
Phone: (510)-642-9494
After-hours support line: (855)-817-5667.

Student Advocate's Office

The Student Advocate's Office handles more formal inquiries/complaints related to academics, financial aid, conduct, and grievances.
(https://advocate.berkeley.edu/)
Phone: (510)-642-6912

The Ombuds Office

The Ombuds Office provides a largely confidential environment to discuss University problems, concerns and complaints and can be a less formal alternative to the Student Advocate's Office.
(https://sa.berkeley.edu/ombuds)
Phone: (510)-642-5754

Coronavirus Policies

We will be following campus requirements as described in links available on this site: (https://coronavirus.berkeley.edu/)
We will accommodate COVID-19 illness just as we would any other illness. Please feel free to reach out with questions.

Teaching Guide

Lesson 1 Plan

Class 1: Introduction to DEI and Scientific Responsibility

Learning goals:

Introduce the course and why we are having it
Students may not have ever taken a course of this kind before, and it is unusual for a graduate chemistry program. In this class they should gain an understanding for why we feel this course is important to require of graduate students.

Familiarize students with basic concepts related to DEI and Science
Students may come from a wide range of background familiarity with DEI, implicit bias, and theoretical frameworks. This class aims to bring everyone up to a basic level of understanding to be able to engage in the case studies in the next few classes.

Notes:
In the original course offering, this class had two 10 minute-discussions. We decided it would be more effective to consolidate these discussions into one longer session at the end of class.

Class 1 timing:

5:00-5:05
Arrivals, discussion question on slide 1

5:05-5:15
Slides 3-4 (intro to class, syllabus information)
Slide 5-6 (learning goals, course themes, classroom agreements)

5:15-5:20
Pre-survey

5:20-5:40
Slides 8-12 (NSF statistics)
Slides 13-18 (implicit bias)
Slides 19-21 (critical race theory and allyship)
Slides 22-23 (what is DEIB, and a framework for intervention)

5:40-5:55
Small group discussion followed by group share-out

5:55-6:00
Wrap up with takeaway points on slide 26
Exit Tickets (note cards)

Lesson 2 Plan

Class 2: Berkeley and Nuclear Chemistry

Learning goals:

Scientific ethics are often complex and long-term consequences are difficult to foresee
Many students may believe that what is right and what is wrong is relatively easy to discern. Students may also believe that their research is inherently good for the world, or that the long term consequences are beyond their control or responsibility. This case study is meant to demonstrate that huge impacts can result from fundamental basic research and the roles that scientists play that are directly relevant to these impacts.

Scientists can have great influence over certain aspects of research and its consequences
While scientists had little power over the eventual usage of nuclear chemistry, many key decisions along the research process were still made by scientists and had large impacts on people. For example, choosing the sites for national lab construction, mining, and testing, were all influenced by scientists.

Who we celebrate for large scientific achievements is often biased
The Manhattan project (and the scientific discoveries leading up to it) was contributed to by a huge number of talented scientists, but the ones we tend to remember are usually white and male (think of the cast of Oppenheimer). However, not only were women and people of color involved in the research, they often played essential roles, and many of these achievements are underappreciated in history.

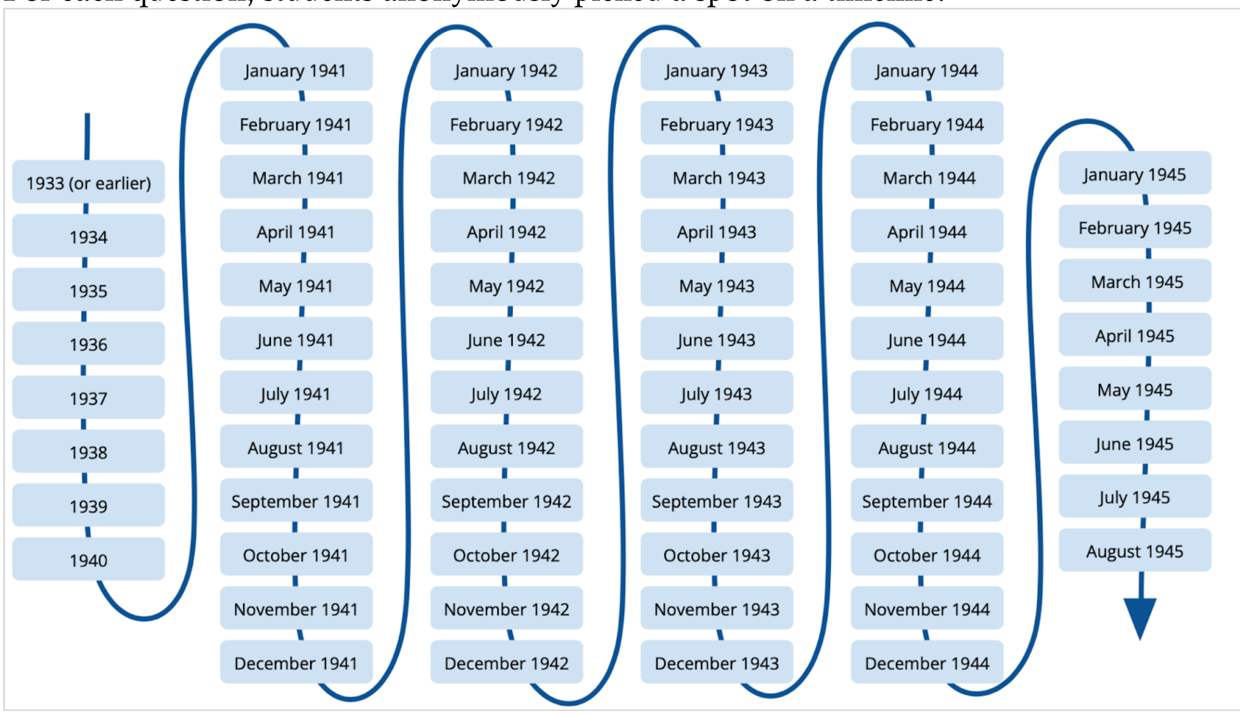
Notes:
This is a highly sensitive topic for many students. Care should be taken to emphasize the respectful discussion guidelines and to introduce the material in a way that is considerate of the students, who may be of Japanese descent, or may have family members who participated in the war. The focus of the case study should not be nuclear weapons and their deployment, but the research process and its impact on indigenous peoples. This is the part of the case study that scientists had influence over, and should be less controversial.

Class 2 timing:

5:00-5:10
Arrivals, discussion question and attendance link on slide 1

5:10-5:25
Slides 4-6 introduction to the topic, setting the scene
Slides 7-12 harms to indigenous populations
Slides 13-16 ethics of military research
Slides 17-21 highlighting Manhattan project researchers with minoritized identities - go fast
We later added Lise Meitner to these slides

5:25-5:35
Reading the handout and answering the live poll on Mentimeter:
Questions are: 1) when was there clear ethical wrongdoing? 2) when should a scientist have intervened?
For each question, students anonymously picked a spot on a timeline:



Results are then shared with the class.

5:35-5:45
Small group discussion

5:45-5:55
Group discussion

5:55-6:00
Takeaway points and exit tickets

Lesson 3 Plan

Class 3: Bias in Problem Selection

Learning Goals:

By not considering societal biases in our research process, we perpetuate existing biases.
This class uses the development of female hormonal birth control as a case study to illustrate how biases (and lack of representation) in research and funding organizations leads to inequities in the research process and access to benefits resulting from the research. Numerous social and political factors are at play as basic research transitions toward applications. The way scientific research is currently conducted often does not take these factors beyond the lab bench into account. By assuming objectivity in the scientific process, we end up perpetuating existing biases.

Alternative scientific research methods are possible, and can build social responsibility into the process
Feminist science is a field of study that considers the scientific research process in the context of social frameworks. It has primarily been applied to analyze biology, medicine, and ecology-related fields, but we can also consider how it relates to chemistry research. In essence, feminist science asks us to recognize that science conducted by people cannot be purely objective. By considering existing biases in society and in research structures and making efforts to counter them, we can actually get closer to objectivity and equity.

Notes:
Students struggled a little with the handout and the frameworks introduced here. This lecture has the most dense/complicated basis in theoretical frameworks. I cut out 10 minutes we allotted in the class time last year for students to read the handout. Instead, the time might better be used by spending more time explaining the concepts as the slides are presented. I added 1 extra slide explaining feminist science, and I reworded some of the questions to be more relevant to this case study and less abstract.

Class 3 Timing:

5:00-5:10
Arrivals, discussion question and attendance link on slide 1

5:10-5:30
Slides 3-6: Classroom agreements and introduction to the topic
Slides 7-12: Impacts of birth control
Slides 13-18: An alternative scientific method

5:30-5:45
Small group discussion

5:45-5:55
Group discussion

5:55-6:00
Takeaway points and exit tickets

Lesson 4 Plan

Class 4: Rare Earth Elements

Learning Goals:

We should consider not only the results and capabilities that come out of our research, but also the sourcing of the chemicals that enable our research
Often, since basic research is on a small scale, we think less about the impact of the materials that are used in our research. However, if our research does become useful in the future, the scale of their use can increase immensely. What do the sourcing, usage, and end-of-life waste streams look like for the chemicals we use? At industrial scales, these can have huge effects on environmental and human health.

The supply chain of chemicals is complex and entangled with social, political, and economic factors
The sourcing and processing of materials often involves many different countries and industries. The mining of metals can be a hugely environmentally destructive process and generate large amounts of toxic waste. Many organic molecule precursors are derived from petroleum processing. The sustainability of these materials, their sourcing, and their waste streams are usually not a priority when we are conducting basic research, but are immensely important practical concerns as basic research translates to real world applications.

Class 4 Timing:

5:00-5:10
Arrivals, discussion question and attendance link on slide 1

5:10-5:25
Slides 3-8: Classroom agreements and introduction to the topic
Slides 9-13: Problems with rare earth mining and sustainability
Slides 14-18: Environmental justice and example solutions to rare earth problem

5:25-5:45
Small group discussion

5:45-5:55
Group discussion

5:55-6:00
Takeaway points and exit tickets

Lesson 5 Plan

Class 5: Legacy Chemicals

Learning Goals:

The large-scale impact of a chemical can be very different from its small-scale behavior in a lab; regulation is a challenge
Chemicals that are relatively innocuous on a lab scale can cause serious environmental and human health problems when they are released into widespread usage. There are so many examples of chemicals whose negative effects are not fully understood until they are ubiquitous in the environment or in consumer products. Sometimes, the negative effects are downplayed or even covered up by corporations. Regulation often leads to banning the chemical with known risks and replacing it with a structurally similar chemical whose risks are not yet known. How can scientists advocate for change in regulatory practices, or design research that leads to better understanding of the risks of chemical compounds?

Supply chains and waste management are complex
Oftentimes, we continue to use compounds and materials that have known risks or detriments because supply chain "lock-ins" make it practically difficult and economically disadvantageous to introduce an alternative. Often, finding a viable alternative does require technological advances, which basic research can contribute to!

Class 5 Timing:

5:00-5:10
Arrivals, discussion question and attendance link on slide 1

5:10-5:25
Slides 3-8: Examples of legacy chemicals
Slides 9-13: Introduction to PVCs and green chemistry
Slides 14-16: How policy regulations are decided and how to apply it to PVCs

5:25-5:45
Small group discussion

5:45-5:55
Group discussion

5:55-6:00
Takeaway points and exit tickets

Lesson 6 Plan

Class 6: Building an Inclusive Community

Learning Goals:

We should recognize the subjectivity of our work as researchers and use this awareness to improve equity and inclusivity

If there's one takeaway from this class, it should be that we cannot separate the research from the researcher. Each person brings their own experiences and standpoints to their work, and this affects how they choose what work they find interesting and how they frame the results in larger contexts. This is inevitable—and it doesn't have to be a bad thing! If we can include all the diverse viewpoints of different members of society, then we can work to ensure that the results of scientific research equitably serves everyone. The perspectives and values that each person brings is valuable and essential to the scientific process.

Collaboration between faculty and students can lead to structural changes in this department

This course grew out of a collaborative effort between graduate students and department leadership, and was supported by results collected from the department-wide climate survey. The climate survey and the annual spring discussion session (cDIBS) have led to many changes in our department in the last few years, and there has been a quantifiable positive shift in our department climate and community. The ability for faculty and students to work together in our department is built on a basis of trust between students and department leadership, and has allowed us to move toward structural improvements. We hope that this dynamic can continue with each new class of students!

Notes: I think depending on how the exit tickets and discussions go over the semester, the content of this class can be shaped to best suit each iteration of the course. The slides can be changed up, and the post-survey can be rewritten. This last class should essentially summarize and reiterate the learning goals of the course overall, and emphasize the importance for faculty and students to work together in our department :)

Class 6 Timing:

5:00-5:10
Arrivals, discussion question and attendance link on slide 1

5:10-5:20
Slides 4-8: Climate survey data that motivated the creation of this course
Slides 9-11: Theoretical frameworks
Slides 12: Research and subjectivity, lead into discussion

5:20-5:30
Small group discussion

5:30-5:40
Group discussion

- Some optional assignments

5:40-5:55
Post-Survey

5:55-6:00
Further resources and wrap up

Guide for Designing Case Studies

There are numerous examples of scientists' and scientific research's interactions with society and the social, political, and economic factors at play. These case studies should illustrate the power of chemistry research, to benefit humanity, but also to harm it when poor decisions are made.

Selection of Topic

The topic should have some relevance to chemistry research, such that students can imagine themselves in the positions of some of the key people involved, or relate the scientific content to their coursework. The case study should also be complex enough such that students can understand that bad outcomes are not always the result of malicious intent, and the challenge of being in roles of responsibility. The case study should have many publicly available facts and details about its history, outcomes and modern day implications. Case studies based on ongoing debates or controversies can also be interesting but may be more challenging and complex for a standalone 1-hour lesson. A theoretical framework through which the case study can be analyzed should also be selected.

Formation of Discussion Questions

After understanding the details of the case study, discussion questions should be formulated to guide students' approach. The questions should lead students to consider their own responsibility in similar situations and the potential risks of their own work. The questions should use the theoretical framework to analyze the positive and negative outcomes, and help place the case study in a wider context. Ideally, during the discussion students should be able to make connections between the case study and other examples they may know, or similar concerns in their own work. In general, questions should ask students to consider:

- Who was affected by the outcomes? Were they informed and did they have agency in deciding these outcomes?
- Who were in decision-making positions? Was the decision-making inclusive and equitable to everyone involved?
- How is the story of this case study usually told? Whose stories are prioritized and whose are often overlooked?

Creation of Lesson

Usually only 15-20 slides of content to describe the case study could be presented within the timing of the class. As such, only key details of the case study should be included in the slides. A more detailed handout and further references should be provided for students to explore in their own time should they be interested. The slides can be structured as: 3-4 slides explaining the context of the case study and the larger problems it represents, 5-6 slides of information on the history and known facts of the case study, 5-6 slides presenting a theoretical framework through which this case study can be analyzed, and the solutions the framework may suggest. Importantly, the presentation of the case study should not be entirely negative without suggesting solutions or positive examples. Students should be given not only examples of how things can go wrong, but also examples of things they can do correctly or better in the future.

Expanding a Case Study

Should students or instructors wish to engage in longer or more complex discussions on a case study, we make a few recommendations for expanding the content:

- What are other examples, recent or historical, of a similar science-society interaction as the one in this case study? How were things handled differently in each case?
- Find some recent scientific research papers on topics related to the case study. Do these papers consider the social contexts discussed in the class? How could the research be conducted differently? How could the results be interpreted differently?
- How do the students' own research relate to the topics discussed in this case study? What might the student do differently to be more mindful of scientific responsibility?
- What other theoretical frameworks might be applied to this case study? Are there experts at your institution who may be able to provide further insight?

Suggested Reading Guide

These are some recommended readings for instructors of the course to familiarize with topics discussed and theoretical frameworks.

Need for Ethics Education in Chemistry:

Schummer, J.; Børsen, T. Ethics of Chemistry: Meeting a Teaching Need. In *Ethics Of Chemistry: From Poison Gas To Climate Engineering*; 2021; pp 1–27. https://doi.org/10.1142/9789811233548_0001.

Class 1 - DEI fundamentals

Critical Race Theory:

Yosso, Tara J. "Whose culture has capital? A critical race theory discussion of community cultural wealth." *Race Ethnicity and Education*, **2005**, *8*(1), 69. DOI: 10.1080/1361332052000341006

Intersectionality:

Crenshaw, K. Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory and Antiracist Politics. *Univ. Chic. Leg. Forum* **1989**, 139–168.

Allyship:

Bourke, B. Leaving behind the Rhetoric of Allyship. *Whiteness Educ.* **2020**, *5* (2), 179–194. https://doi.org/10.1080/23793406.2020.1839786.

I would also suggest skimming over the cited studies in the slides, at least so that the data is understood:

Moss-Racusin, C. A.; Dovidio, J. F.; Brescoll, V. L.; Graham, M. J.; Handelsman, J. Science Faculty's Subtle Gender Biases Favor Male Students. *Proc. Natl. Acad. Sci. U. S. A.* **2012**, *109* (41), 16474–16479. https://doi.org/10.1073/pnas.1211286109.

Ross, M. B.; Glennon, B. M.; Murciano-Goroff, R.; Berkes, E. G.; Weinberg, B. A.; Lane, J. I. Women Are Credited Less in Science than Men. *Nature* **2022**, *608* (7921), 135–145. https://doi.org/10.1038/s41586-022-04966-w.

Régner, I.; Thinus-Blanc, C.; Netter, A.; Schmader, T.; Huguet, P. Committees with Implicit Biases Promote Fewer Women When They Do Not Believe Gender Bias Exists. *Nat. Hum. Behav.* **2019**, *3* (11), 1171–1179. https://doi.org/10.1038/s41562-019-0686-3.

Chen, C. Y.; Kahanamoku, S. S.; Tripati, A.; Alegado, R. A.; Morris, V. R.; Andrade, K.; Hosbey, J. Systemic Racial Disparities in Funding Rates at the National Science Foundation. *Elife* **2022**, *11*, 1–34. https://doi.org/10.7554/eLife.83071.

Class 2 - Nuclear chemistry

There is a lot of material out there on this topic. A good starting place are these two websites:
https://nuclearprinceton.princeton.edu/
https://nuclearprinceton.princeton.edu/tribal-nations-and-communities
https://ahf.nuclearmuseum.org/

An ethical analysis of chemical weapons, that can also apply to weapons research in general:
Schummer, J. Ethics of Chemical Weapons Research: Poison Gas in World War One. *Hyle* **2018**, *24* (1), 5–28.

Governing science:
Jasanoff, S. Technologies of Humility: Citizen Participation in Governing Science. *Soc. e Estado* **2019**, *34* (2), 565–589. https://doi.org/10.1590/s0102-6992-201934020009.

Class 3 - Hormonal Birth Control

History of the development of birth control:
Christin-Maitre, S. History of Oral Contraceptive Drugs and Their Use Worldwide. *Best Pract. Res. Clin. Endocrinol. Metab.* **2013**, *27* (1), 3–12. https://doi.org/10.1016/j.beem.2012.11.004.
Soto Laveaga, G. Uncommon Trajectories: Steroid Hormones, Mexican Peasants, and the Search for a Wild Yam. *Stud. Hist. Philos. Biol. Biomed. Sci.* **2005**, *36*, 743–760. https://doi.org/10.1016/j.shpsc.2005.09.007.

Emotional burden of birth control:
Kimport, K. More Than a Physical Burden: Women's Mental and Emotional Work in Preventing Pregnancy. *J. Sex Res.* **2018**, *55* (9), 1096–1105. https://doi.org/10.1080/00224499.2017.1311834.
Ruhl, L. Dilemmas of the Will: Uncertainty, Reproduction, and the Rhetoric of Control. *Signs (Chic).* **2002**, *27* (3), 641–663. https://doi.org/10.1086/337940.

Feminist science (in order of importance):

1. Roy, D. Feminist Theory in Science: Working Toward a Practical Transformation. *Hypatia A J. Fem. Philos.* **2004**, *19* (1), 255–279. https://doi.org/10.2979/hyp.2004.19.1.255.
2. Lloyd, E. A. Science and Anti-Science: Objectivity and Its Real Enemies. In *Feminism, Science, and the Philosophy of Science*; Hankinson Nelson, L., Nelson, J., Eds.; Kluwer Academic Publishers: Dordrecht, **1996**; pp 217–259.
3. Richardson, S. S. Feminist Philosophy of Science: History, Contributions, and Challenges. *Synthese* **2010**, *177* (3), 337–362. https://doi.org/10.1007/s11229-010-9791-6.

Class 4 - Rare Earth Elements

This one is basically just based on this one paper:

Martin, A.; Iles, A. The Ethics of Rare Earth Elements over Time and Space. *Hyle – Int. J. Philos. Chem.* **2020**, *26*, 5–30. https://doi.org/10.1142/9789811233548_0012.

Environmental Racism:

Campbell, C.; Greenberg, R.; Mankikar, D.; Ross, R. D. A Case Study of Environmental Injustice: The Failure in Flint. *Int. J. Environ. Res. Public Health* **2016**, *13*, 951–961. https://doi.org/10.3390/ijerph13100951.

Community Peer Review / engagement of community in research:

Liboiron, M.; Zahara, A.; Schoot, I. Community Peer Review : A Method to Bring Consent and Self-Determination into the Sciences. *Preprints* **2018**, No. 2018060104, 1–31. https://doi.org/10.20944/preprints201806.0104.v1.

Class 5 - Legacy Chemicals

These papers cover each of the case studies brought up:

Schummer, J. The Chemical Prediction of Stratospheric Ozone Depletion: A Moral Model of Scientific Hazard Foresight. *Hyle – Int. J. Philos. Chem.* **2020**, *26*, 31–54. https://doi.org/10.1142/9789811233548_0013.

Martin, A.; Iles, A.; Rosen, C. Applying Utilitarianism and Deontology in: Managing Bisphenol-A Risks in the United States. *Hyle – Int. J. Philos. Chem.* **2016**, *22*, 79–103. https://doi.org/10.1142/9789811233548_0010.

Scott, D. Ethics of Climate Engineering: Chemical Capture of Carbon Dioxide from Air. *Hyle – Int. J. Philos. Chem.* **2018**, *24*, 55–77. https://doi.org/10.1142/9789811233548_0014.

Iles, A.; Martin, A.; Rosen, C. M. Undoing Chemical Industry Lock-Ins: Polyvinyl Chloride and Green Chemistry. *Hyle – Int. J. Philos. Chem.* **2017**, *23*, 29–60. https://doi.org/10.1142/9789811233548_0011.